Level | Pressure | Flow | Temperature | Liquid Analysis | Registration | Systems Components | Services | Solutions

Technical Information

Omnigrad S TR61

RTD thermometer EEx-d or EEx-ia certified, replaceable insert, thermowell from pipe, process connection: threaded or flanged or sliding. PCP (4...20 mA), HART® or PROFIBUS-PA® electronics

Range of uses

The Omnigrad S TR61 is an RTD industrial thermometer with a inset (Pt100) and thermowell from pipe.
It is developed for the use in the chemical, petrochemical and energy industries, but suitable also for other generic applications.
In compliance to EN 50014/18/20 (ATEX certification) it is therefore particularly suitable also for hazardous areas.
When required, it's also available with a transmitter(PCP, HART® or PROFIBUS-PA®) into the housing.
The process connection of the thermowell can be threaded, flanged or with a compression fitting in compliance to the standard rule DIN 43772 (form 2/3, 2G/3G and 2F/3F).

Application areas

- Chemicals industry
- Energy industry
- Gas Processing industry
- Petrochemical industry
- General industrial services

Features and benefits

- SS 316L/1.4404, SS 316Ti/1.4571 and Hast. C276/2.4819 for the "wetted" parts
- The most common process connections: threaded, flanged and compression fitting are standard; others are on request
- Customized immersion length
- Surface finishing down to Ra < 0.8 µm
- Aluminium housing, with protection grade from IP66 to IP68
- Mineral oxide replaceable insulated insert (MgO) diameter: 3 or 6 mm
- PCP, HART® and PROFIBUS-PA®, (4...20 mA 2-wire transmitters)
- The accuracy of the sensing element (Pt100) is: class A or 1/3 DIN B (IEC 60751) with electrical connection to 2, 3 or 4 wires
- The sensing elements (Pt100) are available in wire-wound WW (range:-200...600°C) or thin-film TF (range:-50...400°C) with single or double Pt100 execution
- ATEX 1/2 GD EEx-ia certification
- ATEX 1/2 GD EEx-d certification
- ATEX 2 GD EEx-d certification

CE ⟨Ex⟩

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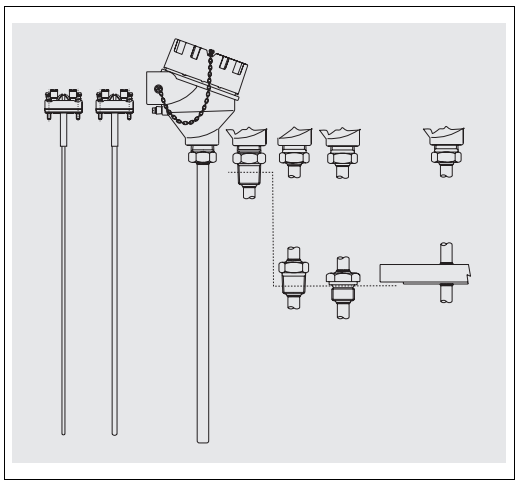
Function and system design

Measuring principle

The RTD (Resistance Temperature Detector), is a sensor where the electrical resistance varies with the temperature. The material of the RTD is Platinum (Pt) with a value of the resistance (R), referred to a nominal value at the temperature of **0°C = 100,00** Ω (in compliance to rule EN 60751; it is called Pt100). The very important is to define the RTD; it is defined with a standard **"α"** value measured between 0°C and 100°C.
This value is: **$\alpha = 3.85 \times 10^{-3}\ °C^{-1}$.**
The temperature is measured indirectly by reading the voltage drop across the sensing resistor in the presence of a constant current flowing through it using Ohm's. The measuring current should be as small as possible to minimise possible sensor selfheating; normally this current is around 1mA, no higher.
The resistance value measured for each degree is about = **0,391 Ohm/K**; over 0°C it is opposite proportional at the temperature. The standard RTD connection at the plant instrument can be to 2,3 or 4 wires for simple or double RTD element.

Equipment architecture

The construction of the Omnigrad S TR61 temperature sensor is based on the following standards:
- EN 50014/18 (housing)
- DIN 43772 (thermowell)
- EN 600751 (inset).



The housing is in painted aluminium alloy; it is suitable to contain a transmitter and/or the ceramic block of the inset; the "Ingress Protection" is from IP66 to IP68.
The thermowell can be made from tube with diameter 9, 11 or 12 mm.
The final part of the thermowell can be straight, tapered or reduced.
The process connection of the thermowell can be threaded (GAS or NPT), flanged (DIN or ANSI) or with a compression fitting (see the section "System components").
The replaceable inset is a probe's tip with a Pt100 positioned into; it is placed inside the thermowell.

Fig. 1: TR61 with the various types of process connections and end parts of the probe

Material & Weight

Housing	Insert	Process connection	Weight
aluminium epoxy coated	sheath in SS 316L/1.4404	fixed or sliding SS 316/1.4401	From 0.5 to 1.0 kg for standard options

Performance

Operating conditions

Operating condition or test	Product type or rules		Value or data of test
Ambient temperature	housing (without head-mounted transmitter		-40÷130°C
	housing (with head-mounted transmitter)		-40÷85°C
Process temperature	Same of measurement range (see below).		
Process pressure (Maximum)	The pressure values to which the thermowell can be subjected at the various temperatures are illustrated by the drawings in fig. 2 . For 9 mm diameter pipes, with a limited flow velocity, the maximum tolerated pressures are the following:		50 bar to 20°C 33 bar to 250°C 24 bar to 400°C
Maximum flow velocity	The highest flow velocity, (of the stream or of the fluid), tolerated by the thermowell, diminishes with increasing lengths, of the thermowell/probe exposed (fig. 2).		
Shock and vibration resistance test	RTD Inset in according to the rule IEC 60751:	Acceleration	3 g of peak
		Frequency	from 10Hz to 500Hz and back
		Time of the test	10 hours

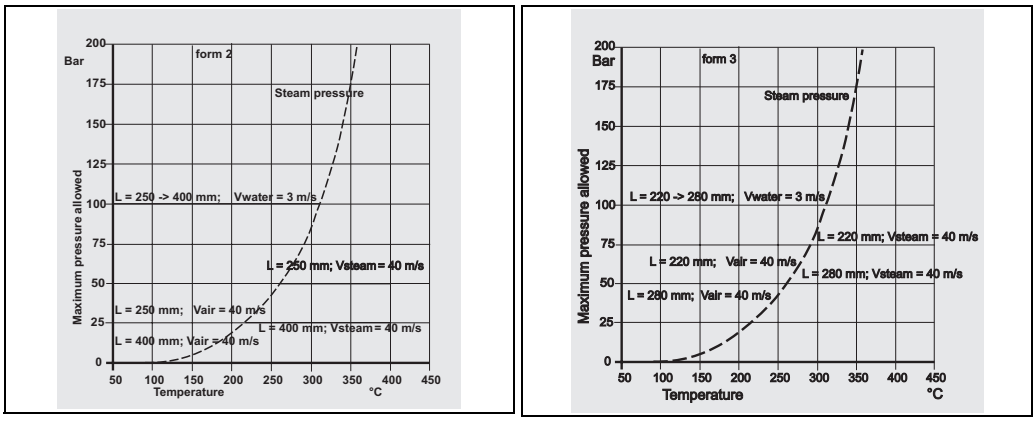
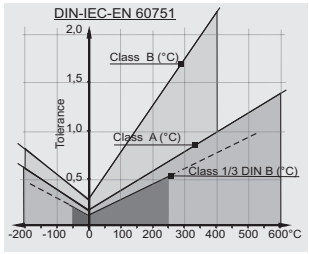


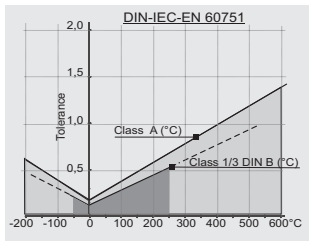
Fig. 2: Pressure/temperature drawing for thermowell with straight tube ø 11 mm in SS 316Ti/1.4571(left), with tapered tube ø 12 mm in SS 316Ti/1.4571 (right)

Accuracy

RTD maximum error type TF - Range: -50 to 400°C		
Cl. A	3σ = 0.15+0.0020|t| 3σ = 0.30+0.0050|t|	= -50…250°C = +250…400°C
Cl. 1/3 DIN B	3σ = 0.10+0.0017|t| 3σ = 0.15+0.0020|t| 3σ = 0.15+0.0020|t| 3σ = 0.30+0.0050|t|	= 0…100°C = -50...0 = 100...250°C = 250…400°C
±3σ = range including 99.7% of the readings. (|t|= absolute value of the temperature in °C).		



RTD maximum error type WW - Range: -200 to 600°C		
Cl. A	3σ = 0.15+0.0020|t|	= -200…600°C
Cl. 1/3 DIN B	3σ = 0.10+0.0017|t| 3σ = 0.15+0.0020|t| 3σ = 0.15+0.0020|t|	= -50...250°C = -200...-50 = 250…600°C
±3σ = range including 99.7% of the readings. (|t|= absolute value of the temperature in °C).		



Others errors	
Transmitter maximum error	See the corresponding documentation (codes at the end of the document)
Display maximum error	0.1% FSR + 1 digit (FSR = Full Scale Range)

The "4 wires" configuration, is provided as a standard connection for the single Pt 100's excludes additional errors in every condition.
Generally in the "4 wires" configuration there is a higher guarantee of accurancy.

Response time

Tests in water at 0.4 m/s (according to IEC 60751; from 23 to 33°C step changes)

Diameter of the stem	Pt100 type	$t_{(x)}$	Reduced tip	Tapered tip	Straight tip
9	TF / WW	t_{50}	7,5 s	11 s	18 s
		t_{90}	21 s	37 s	55 s
11	TF / WW	t_{50}	7,5 s	–	18 s
		t_{90}	21 s	–	55 s
12	TF / WW	t_{50}	–	10 s	38 s
		t_{90}	–	24 s	125 s

Insulation

Measurement Insulation type	Result
Insulation resistance between terminals and probe sheath	above 100 MΩ at 25°C
according to IEC 60751, test voltage 250 V	above 10 MΩ at 300°C

Self heating

Negligible when the E+H iTEMP® transmitters are employed.

Installation

The Omnigrad S TR61 thermometers can be installed on pipes or tanks by means of threaded or flanged connections. The immersion length must take into account all the parameters of the thermometer and the process to measure. If the immersion is too low, an error may be generated in the temperature recorded due to the lower temperature of the process fluid near to the walls and heat transfer, which takes place through the sensor stem. The incidence of such an error can be not negligible if there is a big difference between the process temperature and the ambient temperature. To prevent measuring errors of this kind, it is advisable to use thermometer with a small diameter on well and an immersion length (L) of at least 80÷100 mm.
In small section ducts the tubing's axis must be reached and preferibly slightly exceeded by the tip of the probe (see fig. 3A-3C).
Insulation of the outer part of the sensor reduces the effect produced by a low immersion. Alternatively, it is also possible to adopt a tilted installation (see fig. 3B-3D).
With regard to corrosion, the base material of the wetted parts (SS 316L, SS 316Ti, Hastelloy C) can tolerate the common corrosive media right up to even the highest temperatures.

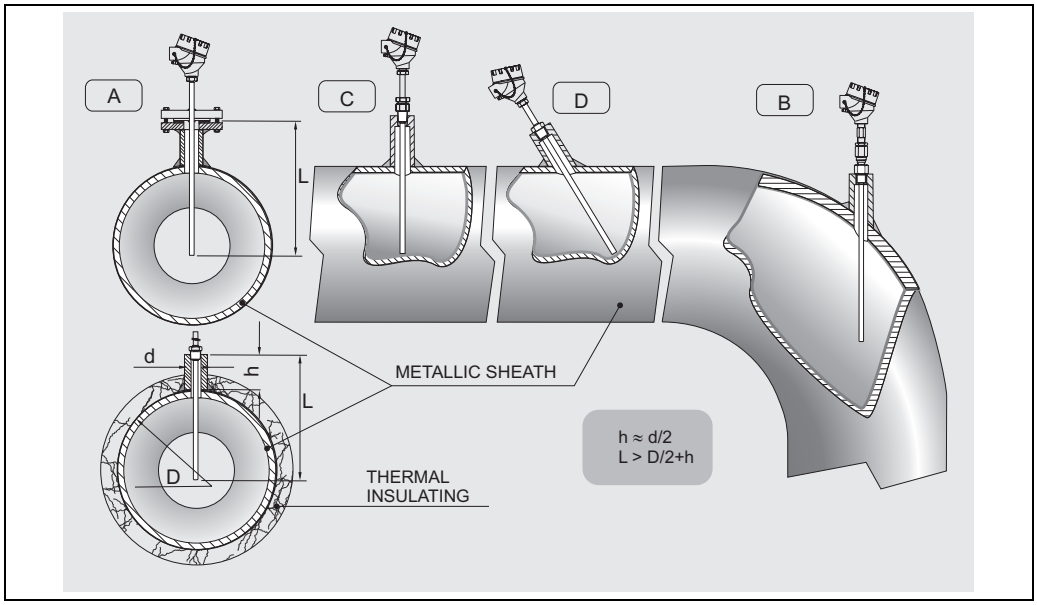


Fig. 3: Installation examples

For further information on specific applications, please contact the E+H Customer Service Department.
In the case that the sensor components are disassembled, in the following reassembly procedure the definite torques must be employed. This will assure the housings with the IP grade defined.
In the case of vibrations the thin film sensing element Pt100 (TF) may offer advantages; the wire wound Pt100 (WW), besides having a larger measurement and accuracy range, guarantees greater long term stability.

System components

Housing

The protection housing, our "TA21H", commonly referred to the “connection head”, is used to contain and protect the terminal block or the transmitter and to join the electric connections to the mechanical component.

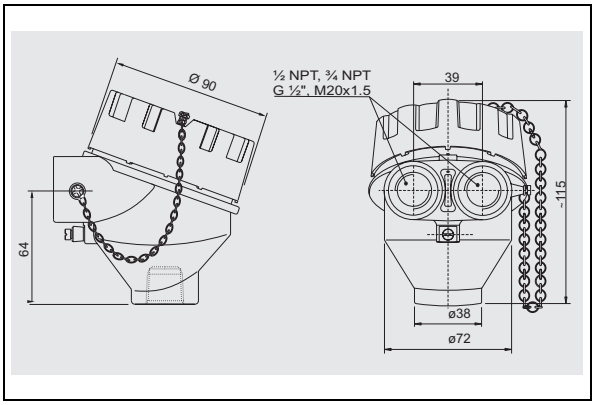


Fig. 4: Housing TA21H

The TA21H used for the TR61 is compliant with EN 50014/18 and EN 50281-1-1, EN 50281-1-2 standards (EEx-d certification for explosion proof type of protection).
The matching of the head with the extension below the head and the cover (threaded) ensures a degree of protection from IP66 to IP68. The head also has a chain to connect the body to the cover, which facilitates the use of the instrument during the maintenance on systems.
The single or double threaded electrical cable entry can be: M20x1.5, 1/2” NPT or 3/4” NPT, G1/2".

Extension neck

The extension neck is the part between the process connection and the housing.
It is normally made of a tube with dimensional and physical characteristics (diameter and material) which are the same of the tube under the connection.

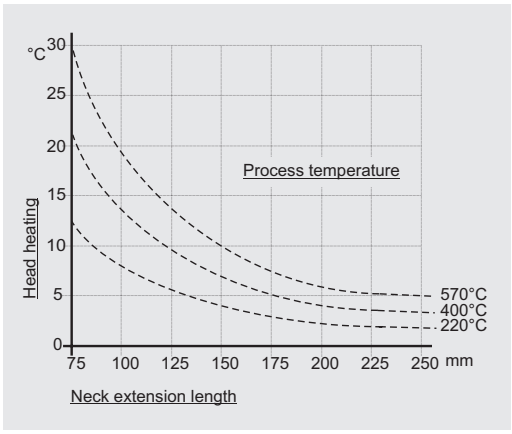


Fig. 5: Heating of the head consequent to the process temperature

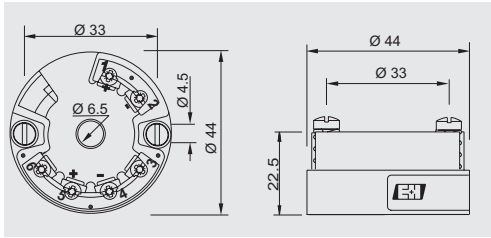
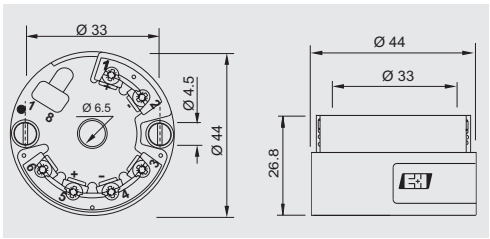
The standard lengths of the neck are 80 or 145 mm, according to the selected option. In accordance with the norm DIN 43772, in the case of a thermowell with a diameter of 12 mm and a tapered tip (form 3G), the extension neck will be respectively 82 or 147 mm. The connection situated in the upper part of the neck allows for orientation of the sensor head. As illustrated by the drawing in figure 5, the length of the extension neck may influence the temperature in the head. It is necessary that this temperature is kept within the limit values defined in the paragraph “Operating Conditions”.

Electronic head transmitter

The required type of output signal can be obtained by choosing the correct head mounted transmitter. Endress+Hauser supplies "state-of-the-art" transmitters (the iTEMP® series) built in 2-wire technology and with 4…20 mA output signal, HART® or PROFIBUS-PA®. All of the transmitters can be easily programmed using a PC:

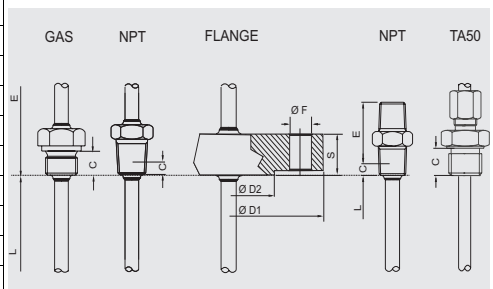
Head transmitter	Communication software
PCP TMT181	ReadWin® 2000
HART® TMT182	ReadWin® 2000, FieldCare, Hand held module DXR275, DXR375
PROFIBUS PA® TMT184	FieldCare

In the case of PROFIBUS-PA® transmitters, E+H recommends the use of PROFIBUS® dedicated connectors. The Weidmüller type is provided as a standard option. For detailed information about transmitters, please refer to the relevant documentation (refer to TI codes at the end of the document). If a head-mounted transmitter is not employed, the sensor probe may be connected through the terminal block to a remote converter (i.e. DIN rail transmitter). The customer may specify the configuration desired during the order phase. The head-mounted transmitters available are:

Description	Dwg
TMT180 and TMT181:PCP 4…20 mA. The TMT180 and the TMT181 are PC programmable transmitters. The TMT180 is also available in a version with enhanced accuracy (0.1°C vs. 0.2°C) in the temperature range -50…250°C and in a version with a fixed measurement range (specified by the customer in the order phase). The TMT182 output consists of 4…20 mA and HART® superimposed signals. TMT182: Smart HART®.	
TMT184: PROFIBUS-PA®. For the TMT184, with PROFIBUS-PA® output signal, the communication address may be set via software or via mechanical dip-switch.	

Process connection

Standard connections are available in the following types: Threaded or Flanged
Other versions may be supplied upon request, while other characteristic are available in the structure at the and of this document. The table below illustrate the engaging lengths and typies of process connections.

Type	ØD1	ØD2	ØS	ØF	C	Thread/Flanged	DWG
Flange	110	79.5	14,5	16	//	1" ANSI 150 RF	
Flange	124	50,8	17,5	19	//	1" ANSI 300 RF	
Flange	115	85	16	14	//	DN25 PN40 B1	
Flange	150	110	18	18	//	DN40 PN40 B1	
Flange	165	125	20	18	//	DN50 PN40 B1	
Thread	//	//	//	//	15	G1"	
Thread	//	//	//	//	15	G1/2"	
Thread	//	//	//	//	15	G3/4"	
Thread	//	//	//	//	8	1/2" NPT	
Thread	//	//	//	//	8	3/4" NPT	

Probe

In the TR61 the measuring probe is made up of a mineral insulated insert (MgO) positioned inside the thermowell. The insert length is available in the standard dimensions DIN 43772 and in the most commonly used ones, or it can be personalized by the client within a range of values (refer to "Sales Structure" at the end of the document).
For replacement, the length of the insert (IL) must be chosen in compliance with the immersion length (L) of the thermowell (see fig. 6). If spare parts are required, refer to the following table.
Although the wiring diagram of single Pt 100s is always supplied with 4 wires configuration, the connection of a transmitter can be executed with 3 wires as well, by avoiding to connect whichever of the terminals (see fig. 6). The configuration Pt100 double with 2 wires and Pt100 single with 2, 3 and 4 wires are available for the ATEX certified inserts.

With regards to the thermowell, the surface roughness (Ra) of the wetted parts is 0.8 mm, while the various kinds of tips (reduced or tapered) are described in fig. 6;

Thermowell type	**Tip of the sensor**	**Insert type**	**Insert**	**(E) Neck**	**Insert Length** (mm)
TW 10 TW 13	Straight Reduced on Ø 9 and Ø 11 Tapered on Ø 9 Tapered on Ø 12	TPR100/TPR 300	Ø = 6 mm Ø = 3 mm	E = 80/82 mm E = 145/147mm	IL = L + E + 33
TW 12	Straight Reduced on Ø 9 and Ø 11 Tapered on Ø 9 Tapered on Ø 12	TPR100/TPR 300	Ø = 6 mm Ø = 3 mm	E = 80/82 mm E = 145/147mm	IL = L + 63
TW 11 (GAS)	Straight Reduced on Ø 9 and Ø 11 Tapered on Ø 9 Tapered on Ø 12	TPR100/TPR 300	Ø = 6 mm Ø = 3 mm	//	IL = L + 70
TW 11 (NPT)	Straight Reduced on Ø 9 and Ø 11 Tapered on Ø 9 Tapered on Ø 12	TPR100/TPR 300	Ø = 6 mm Ø = 3 mm	//	IL = L + 75

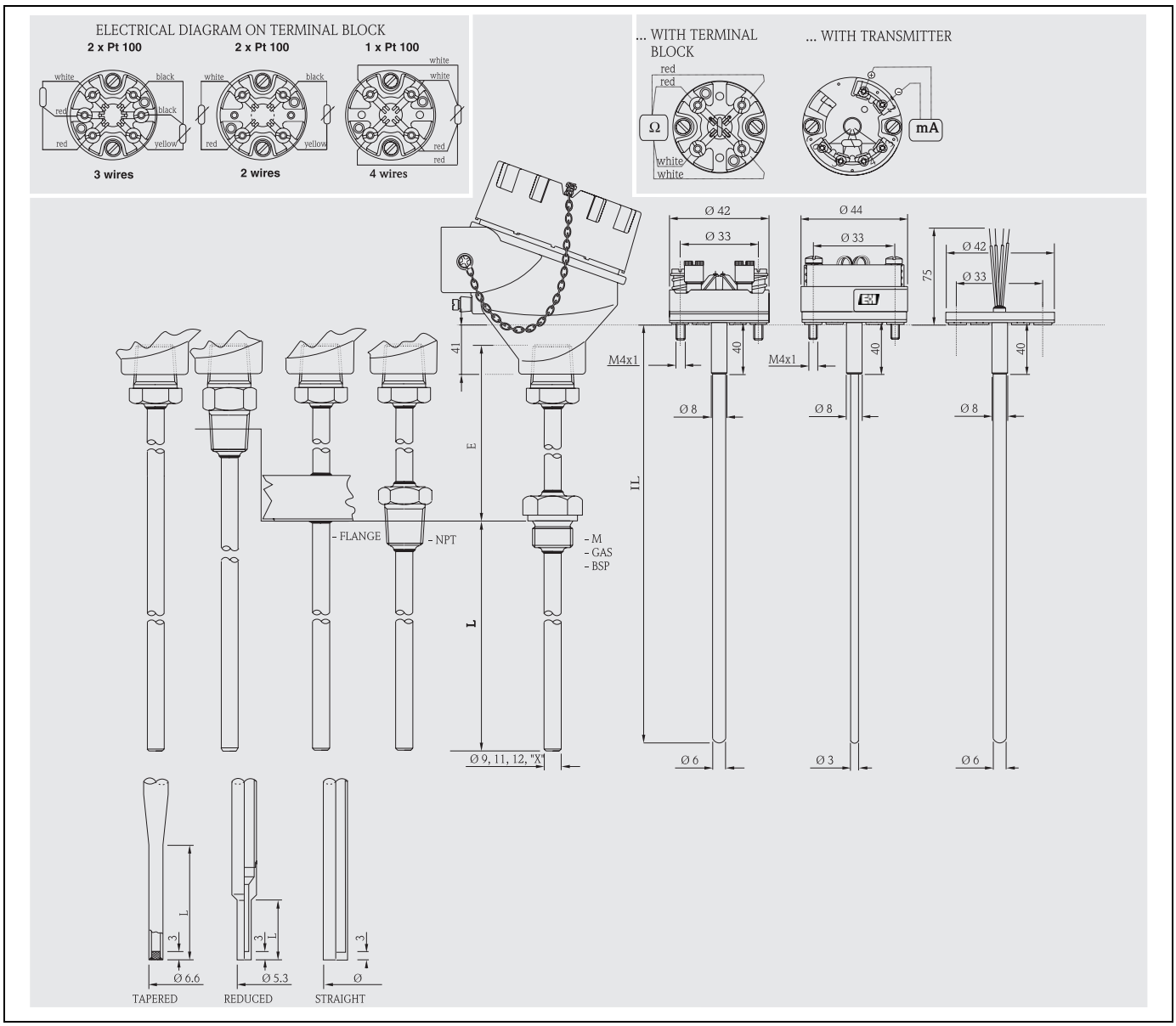


Fig. 6: Functional components, standard electrical diagrams (ceramic terminal block), Tip on the end of the probe

Certificates & approvals

Ex approval

- ATEX Certificate CESI 05ATEX038 for explosion proof type of protection: ATEX II 2 GD EEx-d IIC T6..T5 T85°...T100°C. The TR61 is CE marked.
- ATEX Certificate KEMA 01ATEX1169 X for intrinsecaly safe type of protection: 1GD or 1/2 GD EEx-ia IIC T6...T1 T85...450°C. The TR61 is CE marked.

With regards to the NAMUR NE 24 certificate and the Manufacturer's Declaration according to the standard EN 50018, EN 50020, EN 50281-1-1, EN 50281-1-2, E+H Customer Service will be able to provide further detailed information.

PED approval

The Pressure Equipment Directive (97/23/CE) is respected. As paragraph 2.1 of article 1 is not applicable to these types of instruments. The CE mark according to PED Directive is not requested.

Material certification

The material certificate EN 10204 3.1 can be directly selected from the sale structure of the product and refers to the parts of the sensor in contact with the process fluid.
Other types of certificates related to materials can be requested separately.
The "short form" certificate includes a simplified declaration with no enclosures of documents related to the materials used in the construction of the single sensor and guarantees the traceability of the materials through the identification number of the thermometer.
The data related to the origin of the materials can subsequently be requested by the client if necessary.

Test on thermowell

The pressure tests are carried out at ambient temperature in order to verify the resistance of the thermowell to the specifications indicated by the norm DIN 43772.
With regards to the thermowells that do not comply with this norm (with a reduced tip, a tapered tip on a 9 mm tube, special dimensions, ...), the pressure of the corresponding straight tube with similar dimensions is verified. The sensors certified for use in Ex Zones, are always tested to pressure according to the same criterions.

Further details

Maintenance

The Omnigrad S TR61 thermometers do not require any specific maintenance.
In the case of ATEX certified components (transmitter, insert or thermowell) please refer to the corresponding specific relevant documentation (at the end of the document).

Ordering information

Sales structure

TR61-	Omnigrad S TR61. RTD thermometer Thermometer complete of DIN style pipe thermowell. Replaceable mineral insulated inset, spring loaded in terminal head, IP66 connection with epoxy coating. Two operating and measurement ranges: from -50 to 400°C (with TF); -200 to 600°C (with WW)

Approval:

A	Non-harzarus area
C	*ATEX II 1/2 GD EEx ia IIC
E	*ATEX II 2 GD EEx d IIC
M	*ATEX II 1/2 GD EEx d IIC

Head, material, IP grade

A	TA21H Alu. epoxy coating, , IP66
Y	Special version, to be specified

Cable entry

A	1 x 1/2 NPT
B	2 x 1/2 NPT
C	1 x 3/4 NPT
D	2 x 3/4 NPT
E	1 x M20 x1,5
F	2 x M20 x1,5
Y	Special version, to be specified

Pipe Diameter; Material: (price for 100 mm of L)

A	9 mm; 316L
B	11 mm; 316L
D	9 mm; 316Ti
E	11 mm; 316Ti
F	12 mm; 316Ti
G	9 mm; Alloy C276
H	11 mm; Alloy C276
Y	Special version, to be specified

Neck length E:

0	Not needed
1	80 mm
2	82 mm
3	145 mm
4	147 mm
X	... mm
Y	Special version, to be specified

Process connection:

AA	Special version, to be specified
11	TA50, G1/2", 316L
12	TA50, G1/2", PTFE
13	TA50, G1", 316L
14	TA50, G1", PTFEL
BH	Thread G1/2" A DIN 43772; 316Ti
BJ	Thread G1" A DIN 43772; 316Ti
CA	Thread G1/2" ; 316L
CB	Thread G3/4" ; 316L
CC	Thread G1" ; 316L
CD	Thread 1/2" NPT; 316L
CE	Thread 3/4" NPT; 316L
HD	Thread G1/2" A DIN 43772; HAST. C 276
HH	Thread 1/2" NPT; HAST. C 276
AB	Flange 1" ANSI 150 RF B16.5; 316L
AD	Flange 1" ANSI 300 RF B16.5; 316L
EA	Flange DN25 PN40 B1 EN1092-1; 316L
EB	Flange DN40 PN40 B1 EN1092-1; 316L
EC	Flange DN50 PN40 B1 EN1092-1; 316L
FA	Flange DN25 PN40 B1 EN1092-1; 316Ti
FB	Flange DN40 PN40 B1 EN1092-1; 316Ti

FC	Flange DN50 PN40 B1 EN1092-1; 316Ti
HA	Flange DN25 PN40 B1 EN1092-1; C276 > 316L
HC	Flange DN50 PN40 B1 EN1092-1; C276 > 316L
YY	Special version, to be specified

Tip Shape

M	Reduced, L>=80 mm
R	Reduced, L>=60 mm
S	straight
T	Tapered, L>=100 mm
W	Tapered DIN 43772-3G, , L>=120 mm
Y	Special version, to be specified

Immersion length L

X	...mm
Y	Special version, to be specified

Head transmitter; Range:

F	Flying leads
C	Terminal block
2	TMT180-A21 fix; 0.2K, from..to..°C, span limit -200/650°C
3	TMT180-A22 fix; 0.1K, from..to..°C, span limit -50/250°C
4	TMT180-A11 prog.; 0.2K, from..to..°C, span limit -200/650°C
5	TMT180-A12 prog.; 0.1K, from..to..°C, span limit -50/250°C
P	TMT181-A, PCP, from...to...°C, 2-wire, isolated
Q	TMT181-B, PCP ATEX, from...to...°C, 2-wire, isolated
R	TMT182-A, HART, from...to...°C, 2-wire, isolated
T	TMT182-B, HART ATEX, from...to...°C, 2-wire, isolated
S	TMT184-A, Profibus PA, from...to...°C, 2-wire, isolated
V	TMT184-A, Profibus PA ATEX, from...to...°C, 2-wire, isolated
1	THT1 separate item

RTD Class; Wiring

3	1 x Pt100 TF, cl. A, range: -50/400°C; 4-wire
7	1 x Pt100 TF, cl. 1/3 DIN B, range: -50/400°C; 4-wire
B	2 x Pt100 WW, cl. A, range: -200/600°C; 3-wire
C	1 x Pt100 WW, cl. A, range: -200/600°C; 4-wire
D	2 x Pt100 WW, cl. A, range: -200/600°C; 2-wire
F	2 x Pt100 WW, cl. 1/3 DIN B, range: -200/600°C; 3-wire
G	1 x Pt100 WW, cl. 1/3 DIN B, range: -200/600°C; 4-wire
Y	Special version, to be specified

Additional options

A	TW10, Assembly
B	TW11, Assembly
C	TW12, Assembly
D	TW13, Assembly
Y	Special version, to be specified
0	Not needed

TR61-	**⇐ Order code (complete)**

Sales structure

THT1	**Model and version of the head transmitter**		
	A11	TMT180-A11 programmable from...to...°C, accuracy 0.2 K, span limit -200...650°C	
	A12	TMT180-A12 programmable from...to...°C, accuracy 0.1 K, span limit -50...250°C	
	A13	TMT180-A21AA fixed range, accuracy 0.2 K, span 0...50°C	
	A14	TMT180-A21AB fixed range, accuracy 0.2 K, span 0...100°C	
	A15	TMT180-A21AC fixed range, accuracy 0.2 K, span 0...150°C	
	A16	TMT180-A21AD fixed range, accuracy 0.2 K, span 0...250°C	
	A17	TMT180-A22AA fixed range, accuracy 0.1 K, span 0...50°C	
	A18	TMT180-A22AB fixed range, accuracy 0.1 K, span 0...100°C	
	A19	TMT180-A22AC fixed range, accuracy 0.1 K, span 0...150°C	
	A20	TMT180-A22AD fixed range, accuracy 0.1 K, span 0...250°C	
	A21	TMT180-A21 fixed range, accuracy 0.2 K, span limit -200...650°C, from...to...°C	
	A22	TMT180-A22 fixed range, accuracy 0.1 K, span limit -50...250°C, from...to...°C	
	F11	TMT181-A PCP, 2-wire, isolated, programmable from...to...°C	
	F21	TMT181-B PCP ATEX, 2-wire, isolated, programmable from...to...°C	
	F22	TMT181-C PCP FM IS, 2-wire, isolated, programmable from...to...°C	
	F23	TMT181-D PCP CSA, 2-wire, isolated, programmable from...to...°C	
	F24	TMT181-E PCP ATEX II3D, 2-wire, isolated, programmable from...to...°C	
	F25	TMT181-F PCP ATEX II3D, 2-wire, isolated, programmable from...to...°C	
	L11	TMT182-A HART®, 2-wire, isolated, programmable from...to...°C	
	L21	TMT182-B HART® ATEX, 2-wire, isolated, programmable from...to...°C	
	L22	TMT182-C HART® FM IS, 2-wire, isolated, programmable from...to...°C	
	L23	TMT182-D HART® CSA, 2-wire, isolated, programmable from...to...°C	
	L24	TMT182-E HART® ATEX II3D, 2-wire, isolated, programmable from...to...°C	
	L25	TMT182-F HART® ATEX II3D, 2-wire, isolated, programmable from...to...°C	
	K11	TMT184-A PROFIBUS-PA®, 2-wire, programmable from...to...°C	
	K21	TMT184-B PROFIBUS-PA® ATEX, 2-wire, programmable from...to...°C	
	K22	TMT184-C PROFIBUS-PA® FM IS, 2-wire, programmable from...to...°C	
	K23	TMT184-D PROFIBUS-PA® CSA, 2-wire, programmable from...to...°C	
	K24	TMT184-E PROFIBUS-PA® CSA, 2-wire, programmable from...to...°C	
	K25	TMT184-F PROFIBUS-PA® ATEX II3D, 2-wire, isolated, programmable from...to...°C	
	YYY	Special transmitter	
		Application and services	
		1	Assembled into position
		9	Special version
THT1-			**⇐ Order code (complete)**

Supplementary documentation

❑ Brochure Field of activities – Temperature measurement	FA006T/09/en
❑ Temperature head transmitter iTEMP® Pt TMT180	TI088R/09/en
❑ Temperature head transmitter iTEMP® PCP TMT181	TI070R/09/en
❑ Temperature head transmitter iTEMP® HART® TMT182	TI078R/09/en
❑ Temperature head transmitter iTEMP® PA TMT184	TI079R/09/en
❑ RTD insert for temperature sensors – Omniset TPR100	TI268T/02/en
❑ RTD insert for temperature sensors – Omniset TPR300	TI290T/02/en
❑ Safety instructions for use in hazardous areas (TPR100)	XA003T/02/z1
❑ Industrial thermometers, RTD and thermocouples	TI236T/02/en
❑ Safety instructions for use in hazardous areas (TPR300 to be relais)	XA015T/02/z1
❑ TA fittings & sockets Omnigrad TA50, TA55, TA60, TA70, TA75	TI091T/02/en

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